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Commissioner Mark Spitzer
Arizona Corporation Commission
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Gentlemen:

SUN CITY WATER + SUN CITY WEST UTILITIES
W-01656A-98-0577 + WS-02334A-98-0577

To refresh, I was a member of the infamous CAP Water Task Force and one of two from the Sun City Home Owners Association. As such I am able to provide an insider's view of those proceedings.

The Home Owners Association has published a promotional book on CAP water (copy attached). And I will use that book to give you an item-by-item critique of the various claims about the CAP issue.

The critique is held by fasteners in the center of the portfolio. Pages from the HOA booklet are in the pocket on the left. Informational is in the pocket on the right.

If you have any questions, please call me at 623 933 1162.

Very truly yours,


Donald J. Coleman

Enc. 3 portfolios

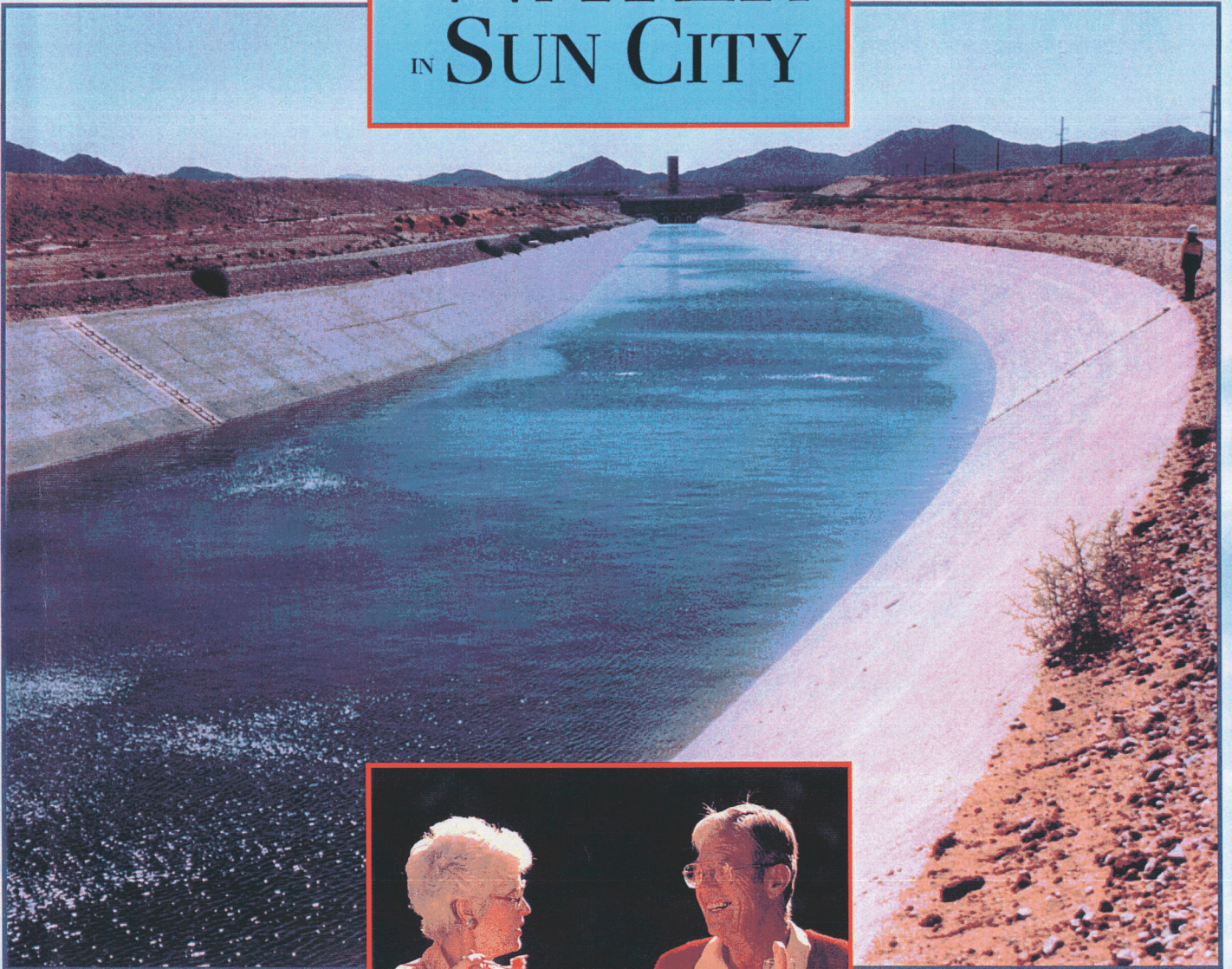
Arizona Corporation Commission

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CAP WATER IN SUN CITY



Sun City's Advocate Since 1963

SUN CITY HOME OWNERS ASSOCIATION

This printed information was funded by a grant from the Arizona Department of Water Resources Conservation Assistance Fund

WHY ARE SUN CITY RESIDENTS CONCERNED ABOUT THEIR WATER?

For most residents of Sun City, the water we use in our homes is something we take for granted. In part, this casual attitude toward our water supply comes from our experience in living in communities in other states where the supply of good water is simply not an issue. An abundance of either rainfall or groundwater has been the rule in most parts of the United States, and cities and towns generally have had no problem in providing an adequate supply of water to their communities.

But we live in a desert.

Our average rainfall in the Valley doesn't come anywhere near matching the needs of our growing communities. Historically, there were two major sources of water for use in the Valley. The first is the Salt River Project (SRP), which supplies water from the Salt and Verde rivers to the area within the legal boundaries of the SRP. None of that water is available to Sun City.

The second major source of water for residential use is pumped groundwater. This is water drawn from the underground aquifer, which exists, at varying levels, beneath the Valley. That aquifer is, in part, replenished each year by natural recharge from rainfall and the streams from outlying areas that feed into the Valley.

But the major problem with the use of groundwater is that our population is increasing far faster than natural recharge can replenish it.

The result is what is called "overdrafting." The population of the Valley is using groundwater far faster than nature can restore it, and the result is a falling groundwater table.

The problem is particularly acute in the Northwest Valley, which includes the Sun City area. The water table in our area of the Valley has dropped hundreds of feet since records were first kept of groundwater levels, and it continues to drop. The reason for that drop is not hard to find. The rapid growth of homes in neighboring Glendale, Peoria, Surprise and Sun City West have all increased in population to levels that were undreamed of when Sun City was first created. These new residents get their water supplies from the same underground aquifer as Sun City does, so overdraft was inevitable.

The impacts of overdrafting and a dropping of groundwater table are threefold: (1) increased cost of pumping; (2) deterioration of water quality; and (3) land subsidence.

The deeper the wells from which you are pumping groundwater, the greater the cost in power and other operating costs. And that cost has to be borne by the residents of Sun City. And the deeper you go to draw up groundwater, the more the quality of the water becomes a problem. The deeper you go, the more heavily the water is mineralized, so it becomes much "harder." It has a bad taste and you experience an increase in the clogging of the pipes that make up the water distribution system.

But land subsidence is the most obvious impact of a falling groundwater table. Just to the south of Sun City, particularly in the area of Luke Air Force Base, one can see remarkable visual evidence of the fact that the level of the land has been dropping steadily. The extraordinary levels of land subsidence, which are clearly visible, are only part of the story, however. The most important evidence available to us is that the Luke area of land subsidence is slowly spreading. And the direction of that spread is moving inexorably closer to Sun City.

The only thing that will stop the spread of land subsidence in the direction of Sun City is to substantially reduce pumping groundwater from beneath our community.

How to go about solving the water problem facing Sun City is not a simple problem. In fact, it is one of the most complex and difficult problems any community can face. But one thing is indisputable -- water is a problem that cannot be ignored.

Residents of the Sun Cities and Youngtown with professional background in water resource management formed the "CAP Task Force" and studied the facts regarding water in the Northwest Valley, and their conclusions are an important part of these papers.

The papers in this booklet are provided by your Sun City Homeowners Association in an effort to educate the community about the water situation, and the measures, which will be essential to deal with it.

SUBSIDENCE: THE MOST OBVIOUS PROBLEM

Subsidence in the surface of the land is the inevitable result of the overdrafting of the groundwater aquifer. As water is pumped out of the ground in amounts substantially in excess of natural replenishment, then over time the land above the groundwater table slowly subsides and land fissures develop.

The amount of land subsidence that will occur in a given area will depend upon the water table, the groundwater pumping rates, the types of soils and the rates of natural recharge. How all those factors will interact to create subsidence in a given area is very difficult to predict, and hence the best predictor of future subsidence is past experience in the particular area of concern. That is, when you have a situation of known groundwater overdrafting (such as we now have in the Northwest Valley), the best guide to use in predicting future subsidence is to look at the history of what is happening in that area.

The attached map shows the area of subsidence that has been occurring in the area just to the south of Sun City. This area is generally known as the "Luke cone of depression," since it is centered in an area adjacent to Luke Air Force Base. The historical records show that this area of subsidence is gradually spreading northward, and that the rate of spread is increasing. The Sun City Homeowners Association (HOA) obtained a photographic record of that subsidence and has posted those photos in its main office on Coggins Drive. Those photographs show a clear and indisputable record of land subsidence that is remarkable in its effect on the land surface immediately to the south of our community. Those pictures are worth examining for the view they give of upended and broken pavement and underground piping. And those views, of course, are a predictor of the damage that could occur in the Sun City community.

HOA has also commissioned two studies by an eminent geology expert (Herb Schumann) to show the scientific basis of the spread of subsidence now heading in the direction of Sun City. Dr. Schumann's studies clearly show the future danger of subsidence in the Sun Cities area.

In the Northwest Valley, the spread of subsidence also correlates with three other particularly nasty features. First, the underground complex surrounding Luke has an extremely high salt content. As water is withdrawn from beneath Sun City, and the underground water table drops, there is an increasing opportunity for very salty (i.e., highly mineralized) underground water to migrate northward toward Sun City. The potential result is an even greater amount of degradation in the quality of the water, which is used by Sun City for all its residential drinking water.

The second extremely serious impact of subsidence is that once it occurs, it is irreversible. As the surface of the land subsides, the sub-surface layers of land compact as water in the soils is squeezed out. And once the water that is normally a part of underground soils is removed, the sinking of the land compacts those soils in a manner, which precludes water from reentering. As a result, once subsidence occurs, the land becomes permanently sunken, and there is no way to correct the situation.

And third, the rate at which the Northwest Valley is overdrafting groundwater is steadily increasing. That is, as communities are being built up around Sun City, their increasing population places an increasing demand on the groundwater supplies. Neighboring communities recognize this problem, and are taking steps to make better use of CAP water themselves. However, their efforts, while laudable, are currently not enough to stop the steady drop in the water table. Thus, a combination of overdrafting by the Sun Cities, coupled with overdrafting by its surrounding communities, has led to a major problem.

Obviously, the time to deal with subsidence is before it occurs. And the only way to do that is to stop the overdrafting of the underground aquifer. Any reduction in groundwater pumping will help the situation. The use of CAP water by the residents of Sun City is probably not enough to completely resolve the threat of subsidence in our community. But it is an important step in the right direction.

CAP WATER: WHAT IS IT?

"CAP" is the "Central Arizona Project." CAP is the broad acronym used to designate the canal system that is used to bring water from the Colorado River across Arizona to Phoenix and Tucson.

Going back four decades ago, the political leadership of Arizona recognized that in order for the major metropolitan centers of Arizona to be able to grow, we were going to have to find an additional source of water. The water available here in the desert was a very finite and limited quantity, and would be nowhere near enough to accommodate the growth that was clearly on its way. Not only was surface water limited and subject to drought cycles, but groundwater supplies were even less likely to be adequate for the long run.

Arizona fought a long and difficult legal battle with the states of Colorado, California and Nevada to get a fair share of the water available in the Colorado River. The result of that legal battle was a compact between those three states (and the U.S. Government) which guaranteed Arizona enough water to assure its economic future. But there was no way to take delivery of that water. That is, no natural channel exists which would get water from the Colorado River over into the Phoenix Valley.

Accordingly, the state of Arizona entered into an arrangement with the federal government to build the CAP canal system, which would deliver Arizona's share of Colorado River water to the Valley. That CAP canal is a marvel of modern engineering, and is now fully operational.

Colorado River water is basically good surface water. It is used by communities all up and down the Colorado basin, and is a mainstay of the water system, which serves Southern California. It can be used directly on agricultural crops, although it is often mixed with local water supplies to deal with its slightly higher mineral content. It is suitable for use on golf courses as turf irrigation, although most golf course users will do a minimal filtration in order to avoid clogging sprinklers.

Colorado River water is also used extensively for drinking water purposes, although treatment is required. Both Phoenix and Glendale, to cite two close-by examples, treat CAP water for use as part of their municipal water supply.

As you would expect, CAP water is not cheap. The future costs of CAP water are expected to continue to rise, and costs which could be as much as four times the present cost of pumped groundwater are possible. But unfortunately, it's the only alternative we have.

Firm subscription or contract speaks for almost all the currently available CAP water. As a result, you just cannot go out in the market and buy CAP water. However, Citizens Water Resources did, at the very inception of the CAP program, reserve a block of CAP water for use by Sun City. That amount of water (4,189 acre/feet) is a relatively small portion of Sun City's overall residential needs, but is a significant offset to the groundwater pumping now being done in the local area.

Unfortunately, that Sun City block of CAP water is now in a "use it or lose it" situation. If that CAP water is not put to productive use in the Sun City area, Citizens will not be in a position to charge for it, and hence will return it to the general state pool of CAP reserves. And once lost, it is gone forever to our community.

HOA leadership studied the possibility of getting other surface water supplies to enable it to deal with the subsidence problem (purchasing water from Indian tribes, for example), but no other possible water source could be made to work.

HOW CAN CAP WATER BEST BE PUT TO USE IN SUN CITY?

In its deliberations on the use of CAP water, the CAP Task Force considered at least seven different plans for using CAP water in the Sun City community. Each of those plans had some merit and some disadvantages. Each of the plans was analyzed to bring out all the facts of what was involved in making use of CAP water. That research work very quickly revealed that the Task Force, in trying to decide what was the best way to make use of CAP water, would first have to agree on the objectives for putting CAP water to use, and then measure the various plans against those objectives.

In other words, an understanding of the goals, which the community had in making use of CAP water, had to be the driving force in deciding the best plan to make use of CAP water.

It didn't take long to recognize that one basic goal was of paramount importance to the Sun City community. Namely, if Sun City residents were going to pay for the CAP water, then it had to be put to use directly in Sun City. To deal with problems such as subsidence, Sun City needed the benefit of real water which could be put to use in restoring the effects of the over-pumping which impacted groundwater levels. There was no value, for example, to implementing groundwater recharge projects located some distance from Sun City. In addition, whatever plan was chosen had to be feasible from an engineering perspective, and had to be doable at a cost that could be borne by the water rate payers of Sun City. It was also felt that any water use plan, which didn't meet that one basic goal of being of direct use in our community, would not be acceptable to the people who would have to pay for CAP water.

For example, several persons thought initially that storing water in a recharge basin a considerable distance north of Sun City might be acceptable since, with time, that water would seep down underground and then likely migrate southward underground and ultimately benefit the water levels under Sun City. However, it was soon realized that underground migration rates took place, at best, in terms of feet per year. And as a result, water recharged miles north of Sun City would take many decades to even begin to affect our community. Because such a plan would not directly benefit the people who would be paying for the CAP water, it was judged unacceptable.

Unfortunately, there are no land areas available in Sun City, which could be put to use as a settling pond for recharge purposes.

What was realized early on in analyzing the possible uses of CAP water is that if you shut off the pumps that are presently pumping groundwater beneath Sun City, you bring about an immediate and direct relief to the pressure being put on the underground aquifer. That is, the best way to stop the effects of mining groundwater is to cut back on

existing pumping. And so the CAP Task Force looked for ways to use CAP water in a manner that would reduce the current level of pumping.

One possibility, of course, would be to build a CAP water treatment plant and use the water for drinking purposes as a replacement for the water currently being pumped for residential use. That idea was rejected because the costs of such treatment would have been prohibitive in light of the amount of water available. A second possibility was based on recognition that the Rec Centers' golf courses in Sun City currently have the right to pump groundwater for turf irrigation purposes. Since CAP water has been used for years for golf course watering with no ill effects, this made it an ideal solution to be considered.

After a great deal of study, a plan was evolved to bring CAP water from the CAP canal to the Sun City golf courses, and thus save groundwater pumping which would otherwise have been required to keep the courses green. This plan requires the construction of a pipeline to get the CAP water from the canal to Sun City, and some filtering of the water to remove solid materials that might otherwise clog the delivery system. Engineering studies were done to make sure the plan was feasible, and to carefully estimate the costs involved. Citizens hired independent engineers to make those studies, and then the Sun City Home Owner's Association, through its grant, hired its own engineer to verify that the costs were within the limits that had been estimated.

The more it was considered, the "golf course" plan only made common sense. If you stop pumping groundwater, you give the aquifer a chance to recover. The engineers on the CAP Task Force were quick to point out that the simplest plan is usually best, and the simple approach of using CAP water on the golf courses to reduce the present over-pumping represents the kind of common sense that the residents of Sun City would readily understand.

It was recognized that the "golf course" plan was more expensive than plans, which would recharge the water at some distance from Sun City. However, as the various possible alternative plans are considered, it becomes obvious that only the golf course plan meets the basic goal which was set to evaluate how to best make use of CAP water. And as a result, the CAP Task Force clearly and firmly recommended going forward with a plan to use CAP water to substitute for most of the current groundwater pumping on the golf courses.

This paper is only a very brief summary of all the analysis that went into the choice of the "golf course" plan as the best vehicle to put CAP water to use in Sun City. The serious student of water use planning should review the CAP Task Force report for further information on the subject.

DOCKETED

FEB 04 2003

A CRITIQUE OF "CAP WATER IN SUN CITY"

DOCKETED BY

CAR

Re PAGE 1, Seventh statement, beginning with :
"The problem is....."

Please note that the rain which once fell on the farm fields now falls on the impervious streets, driveways, sidewalks and parking lots in these new developments. And this rainwater is now collected and deliberately diverted into storm retention areas, or into the New River, or into the Agua Fria wash for recharge. All this instead of falling on the former farm crops or on semi-desert land as it did 20 years ago.

Note also that these new developments are or will soon be making good use of their treated waste water via recharge and/or irrigation. On the other hand, reference books reveal that agriculture activity, at best, would have recharged no more than 4% of the irrigation water it received. And so about 96% of the groundwater that is (and was) used for agriculture is used once and then it's lost forever.

Although the proportions have tightened up, agriculture should continue to dominate groundwater consumption in the Pheonix AMA for some time.

But if HOA is looking for a scapegoat in the groundwater issue, they need only look in the mirror. Why? Because the best way to evaluate a community's real interest in groundwater conservation is to look at its "GPCD" (gallons per capita per day) consumption rates.

The CY 2000-2010 "Third Management Plan" authored by the Department of Water Resources reports the following average GPCD for 1992-1996:

City of Glendale.....210 GPCD
City of Peoria.....196 GPCD
Sun City.....273 GPCD

Note the Sun City GPCD amount pertains only to the potable water delivered by the water purveyor, ARIZONA-AMERICAN. It does not include the hundreds of millions of gallons of groundwater water pumped by our golf courses.

But why is the Sun City GPCD average so high when about 99% of our single family dwelling units use gravel, stones, rocks, et cetera for ground cover?

Well, about 33% of our living units are condominiums. And virtually all of those condos have acres of lush foliage (green grass and trees) growing on any piece of land not occupied by buildings or pavement (See Exhibit B). All of it is irrigated. That irrigation water comes from our aquifer via Arizona American Water Co. Further, the Task Force record reveals the Condominium Association representative admitted that Condominium water usage is 2 1/2 times that of other Sun City homes. Thus we in Sun City pretend to be concerned about groundwater while at the same time we squander huge amounts of groundwater as we try to make this place look like INDIANA !

Now HOA and the Recreation Centers are trying to stick us with a \$15,000,000 pipeline under the guise of a "groundwater savings" scheme.

PAGE 2, first statement. Beginning with: The deeper....

Regarding the increased cost for pumping groundwater, the water theoretically "saved" annually under the pipeline scheme would average about five and one-half inches under Sun City area. Assuming the power required for well pumping is proportional to the depth-to-water, then that five and one-half inches could theoretically reduce the pump power demand about 0.11% per pump. The statement while not untrue, is certainly misleading.

Re Page 2, second and third statements. Beginning with: "But land subsidence..."

This statement makes exciting headlines but is lacking in substance. "Subsidence" is the most common refrain heard whenever someone from HOME OWNERS ASSOCIATION (HOA) is quoted on the subject of groundwater. It's practically their theme song. But to my knowledge they have yet to promulgate the results of their calculations. Can it be that they have not completed any ?

I grant you it would be time consuming. If HOA does not have X-RAY eyes so they can see into the earth, they probably will have to look first at the Drillers Logs for Sun City to learn the type and arrangement of the materials down below. But since bedrock is about 2500 feet down under Sun City and our wells are only about 1200 to 1400 deep, one would have to make some educated guesses about the consist of those deeper places. In any event, one would have to know the unit weight and the elastic limit of the cobbles, gravels, sands, clays etc. down below. And, for any materials below the water table, the flotation effect on each.

When the above activities are completed we will learn today's intergranular stresses at today's groundwater level. But what if one wants to make forecasts of future subsidence as HOA seems wont to do? Well, one merely(?) selects a new water table elevation that will occur six months from now, a year from now, five years from now, or whatever, and repeats the above .

Only when HOA reveals their calculations should we have any faith at all in their subsidence warnings.

About four years ago the Arizona Department of Water Resources (DWR) was planning to monitor subsidence by means of a global positioning system. Instead of echoing "CHICKEN LITTLE", HOA should first report the results of DWR's research.

Reduced golf course pumping will not result in a layer of groundwater reserved for Sun City alone. That groundwater will flow towards well pumps outside our boundaries if our neighbors demands are greater than ours. Why?

Why not? For instance, if there was a deep underground barrier which coincided with our Sun City political boundaries, it would very likely serve to keep our unpumped groundwater in place. Is such a barrier probable, possible, or unlikely?

A look at DRILLERS LOGS from within and outside of our political boundary with Peoria reveals the random multi-layered distribution of sands, gravels, clays, rocks, etc we expect to see in alluvium (Somehow "detritus" has gradually morphed into "regolith" and then into "alluvium".) The small mountains we see on the horizon are the remnants of mountains that developed 10,000,000 years ago. Over time, rains and sometimes winds, have carried pieces of regolith (weathered mountain rock, mostly granite in this instance) downslope and out into the valley. Exhibits C and D show this phenomenon and nicely illustrate the random dispersal of regolith. And they certainly reveal why there should be no expectation of an underground water barrier around Sun City!

IT IS IMPORTANT TO ACKNOWLEDGE THAT THIS RANDOM ACTIVITY CERTAINLY DOES NOT CREATE POLITICAL BOUNDARIES IN THE ALLUVIUM.

WITH REALITY ESTABLISHED, HOW CAN ANYONE RIGHTLY PROCLAIM THAT SUN CITY'S POLITICAL BOUNDARIES CAN PREVENT GROUNDWATER FROM MOVING ACROSS SAID POLITICAL BOUNDARIES?

Further, the wells of some of our neighbors can actually remove existing groundwater from beneath Sun City! An easily visualized impact that outside wells can have on Sun City groundwater occurs when we consider the phenomenon called the "CONE OF DEPRESSION" (Exhibits E and F).

Please notice this quote from the reference book GROUNDWATER AND WELLS, F.G.DRISCOLL, Ph.D. 1986: "When pumped, all wells are surrounded by a cone of depression. Each cone differs in size and shape depending on the pumping rate, pumping duration, aquifer characteristics, slope of the water table, and recharge within the cone of depression of the well."

For more than two years I have been saying that some wells of our neighbors could withdraw groundwater from beneath Sun City. The pipeline crowd has repeatedly denied (without substantiation) that such a thing would occur. Previously I had only indirect evidence and logic to support my claim.

I now have the temporary use of a computer program which will calculate the diameter of the cone of depression for a given water well. By entering a variety of data available from the Department of Water Resources and other sources, one can determine which outside wells are capable of taking groundwater from beneath Sun City. The program does this by calculating the likely diameter of the cone of depression of said well. Once we know the diameter it is easy to scribe an arc onto a topographic map of our area. The arc depicts the well's intrusion into the aquifer under Sun City.

Even though the program reveals some Peoria pumps can be scooping some groundwater from beneath Sun City, the program also reveals that the depth of the incursions is within the ten-foot legal limit to do so.

EXHIBIT "A" depicts some areas in Sun City where Peoria wells which can indeed pump groundwater from beneath Sun City. Now, the pipeline crowd is sure to whine that the Peoria wells would seem to be scooping out a relatively small amount of our groundwater.....But, FOR THE SAME REASON A WOMAN CANNOT BE JUST A LITTLE BIT PREGNANT, AN OUTSIDE WELL IS EITHER SCOOPING WATER OUT FROM UNDERNEATH SUN CITY OR IT IS NOT! There is no inbetween.

Since some of the pipeline crowd have repeatedly stated such pumping could not happen, I believe I have offered sufficient evidence to make my case.

Re PAGE 3, first statement. Beginning with....Subsidence in the...":

When the water table elevation is lowered, its buoyancy effect (called "Archimedes Principle") on the underground alluvium is reduced in some proportion to that drop. At the same time, the intergranular pressure on the deeper alluvium is increased in some proportion to the value of that lost buoyancy.

Subsidence occurs when some of the alluvium compacts. And it compacts if the intergranular pressure between the particles exceeds the modulus of elasticity of some of the alluvium material (clay for instance is the alluvium most susceptible to compaction). Again I say, HOA is trying to scare people without presenting any evidence for its conclusions. THE FALSE STATEMENTS IN THIS HOA BOOK ARE BEING USED TO FRIGHTEN OUR POPULUS INTO ENDORSING THE PIPELINE SCHEME!

Re PAGE 3, second statement. Beginning with.... "The amount..."

HOA's terminology is incorrect. "Soil" is a combination of mineral matter, organic matter, air, and water. The material HOA is trying to describe is properly called regolith (a layer of rock and mineral fragments produced by weathering).

Re PAGE 3, third statement. Beginning with... "The attached..."

As mentioned above, the key to actually understanding this problem is to become acquainted with the geology under Sun City and to do the necessary calculations to determine the intergranular pressures underground. Instead, HOA tells us to look at a map and then repeats the old subsidence theme they have delivered for years. Has HOA checked with Peoria, El Mirage, and Surprise to see if their timeline agrees with HOA's? By the way, just what is HOA's timeline for this impending disaster?

Re PAGE 3, fourth statement. Beginning with..."HOA has..."

HOA will have to make these studies available to the general public. Otherwise we'll have to consider the statement to be just another empty threat. To repeat, a drop in the groundwater level usually results in an increase in the intergranular pressure down below because of the corresponding reduction in the total buoyancy effect (good old Archimedes again). If the underground pressure is great enough, some compaction will occur. I haven't heard HOA say when it will occur. Only: "Subsidence is coming"! So is Christmas.....But at least it has a date.

As an example of HOA's understanding of the cause of subsidence, let me quote from a letter by Mr. Gerald Unger, the HOA President, in a local newspaper: ".....if Sun City, Sun City West, and Youngtown continue to pump and the water level continues to recede, THE EMPTY SPACE IN THE GROUND WILL COLLAPSE (emphasis added) and the resulting subsidence may affect your house."

Comment: I have at least eight textbook/reference books on my bookshelf that agree with my description of the mechanism of subsidence. None of my other references agree with HOA President Unger's: "....the empty space in the ground....". THIS FROM THE HOA THAT HAS BEEN TELLING YOU THE PIPELINE IS THE BEST WAY TO UTILIZE OUR CAP ALLOTMENT AND THUS PREVENT/FORSTALL SUBSIDENCE!

RE PAGE 3, fifth statement. Beginning with..."

This paragraph is misleading. Water does not flow uphill. Reports prepared by experts at the Department of Water Resources (DWR) reveal the elevation of Sun City groundwater is significantly higher than that of Luke Air Force Base. They also reveal the Surprise/El Mirage water table is lower than Sun City's. With all this in mind, why does HOA think the salty water is headed uphill toward Sun City? This appears to be just another flawed statement used as a scare tactic by HOA in order to obtain support for their pipeline scam.

Re PAGE 4, 1st statement, second sentence:

HOA has the sequence backwards. When the modulus of elasticity of the deeper aluvium grandules is exceeded due to the weight of the material above, some aluvium will compact. The usual consequence of compaction is subsidence. According to some sources, subsurface "bridging" of underground material can interfere with some of that subsidence. (Another example of HOA's apparent lack of understanding).

Re PAGE 4, Second statement. Beginning with... "And third...."

It sounds like HOA is belittling our neighbors efforts towards recharging. It appears HOA has forgotten that about three years ago, the Northwest Valley Advisory Board concurred with the idea of giving the Agua Fria Division of Citizens Utilities more than half the Sun City CAP allotment. Sun City HOA and Sun City West PORA were and probably still are members of the Advisory Board. At the time of that decision, it was thought Citizens Utilities would make quick use of the reallocation while Sun City would continue its constant wrangling over the use of CAP water.

Re PAGE 4, Third statement. Beginning with... "Obviously..."

HOA has been talking about a subsidence threat for many, many years. The time to PUT UP OR SHUT UP is long overdue.

The REAL most "obvious" thing about HOA's pipeline scheme is that some of the Task Force believed in the fiction that unpumped groundwater under Sun City would pile up down there even if the water level of our neighbors recedes. Unfortunately for HOA, on this planet water seeks its own level.

Re PAGE 6, third statement. Beginning with....HOA..."

If HOA has any documentation that supports such dialogue with the Indian Tribes, This would be a good time to reveal it. I havent noticed this in their press releases.

Re PAGE 7, first six statements.

All of this dialogue reveals there was a significant flaw in the CAP proceedings. AND IN MY OPINION, IT WAS A FATAL FLAW!

Only a small number of the Task Force people appeared to have any understanding at all of the geology of the Range and Basin area of Maricopa County. Even fewer had a realistic concept of groundwater movement within such an area. And because so many members were naive on the subject of groundwater, it was possible for a few strong-willed individuals to promote their erroneous belief that unpumped groundwater would accumulate under Sun City even though we share a porous aquifer with our neighboring communities.

I did not attend the first meeting of the Task Force. But the record pertaining to that first meeting reveals it was devoted to developing a mission statement, establishing the ground rules, the work schedule, a list of 26 Issues and concerns, etc. The record also reveals that, at this early stage, someone wanted to know if CAP water would/could be used on golf courses. THINK ABOUT IT! WITHOUT ANY FINDING OF FACT AT ALL, ONE OR MORE MEMBERS WERE ALREADY THINKING ABOUT SPRAYING CAP WATER ON GOLF COURSE GRASS.

The record of Meeting #1 also does not reveal if any members had an interest in receiving a general briefing on the subjects of geology and groundwater. That's unfortunate (in hindsight IT WAS THE "FATAL FLAW") because so many did not understand the basic concepts of our local geology and of groundwater in general. With a decent set of slides, the fundamentals could have been imparted to the Task Force in two hours. Probably less. (And that introduction to hydrology might have stimulated the members to buy or borrow a reference book or two on the subject). Unfortunately that

did not happen. Thus it was possible to sway the naive into believing it was necessary to pipe CAP water to Sun City in order to gain any benefit. Incidentally, "benefit" quickly morphed into "direct benefit".

With such a technically naive audience, it was possible for them to also swallow the fiction that the unpumped groundwater would pile up under Sun City.

In my opinion the idea that the CAP water had to be put to use directly under Sun City "or the public would not accept CAP water" was voiced often enough that some people inside and outside the Task Force began to believe it. But I certainly don't recall any early groundswell of feelings for that stance.

Re PAGE 7, fourth statement. Beginning with .."For example..."

Same childish thinking as above. This would not have occurred if the Task Force had been properly briefed on the concepts of groundwater. Instead, only those who had the gumption to enlighten themselves about this strange new subterranean world were in a position to make a rational judgment on the matter. The rest did not have a clue or had already decided on the answer before the meetings began.

Please remember the old saying: "An incoming tide raises all ships." The AGUA FRIA project that HOA belittles so much can be looked at in the same light as the tide. By participating in the AGUA FRIA recharge project which has been designed by professionals and is managed by the CENTRAL ARIZONA WATER CONSERVATION DISTRICT (who have been operating pilot recharge projects in Arizona for several years), Sun City residents can avoid paying the \$15,000,000 capital cost of the golf course watering scheme and yet retain all the benefits of our CAP allocation. THIS IS A WIN-WIN SITUATION IF I EVER SAW ONE (Please see Exhtbit "J"). In contrast, HOA is touting a pipeline project which is based on a flawed premise. AND IT HAS A \$15,000,000 PRICE TAG!

Task Force records pertaining to the evaluation process reveal the recharge option was by no means "unacceptable". Said evaluation process developed dimensionless numbers which represented the perceived "worth" of each option without regard to cost. In spite of the apparent bias in voting, the golf course option was seen to have only 12% greater "worth" than the recharge project. See attached bar graphs (Exhibit G) pertaining to "worth".

HOWEVER TO ATTAIN THAT SMALL INCREASE IN "WORTH", THE PROJECT COST WOULD INCREASE 237%!

THAT IS A MISERABLE BENEFIT - COST RATIO!

Did I mention there could be bias in the evaluations?

Consider the following:

One "At Large" member said about halfway through the three-month-long Task Force meetings: "I will vote to use CAP water only if it is used on the golf courses".

During the critique about the voting process to be used to establish the "weights" of the various criteria, a member (who happened to be chairman of the Sun City Rec Center Golf Committee) said he was weighing criteria based on his "favorite options". But it was too early to establish options. We were still working on criteria.

When we were using the computer-assisted decision process, one member from the Sun City West Rec Centers, when admonished by the Faciltator for giving a dramatically higher value to one increment of the options than the rest of the participants, blurted out: "But I want my project to win".

enough said

The record for the April 21, 1998 Task Force meeting shows the Facilitator said that the "members will first weight the relative importance of the criteria. Next they will rate each option on a scale of 1 to 9 as to how well the option meets the criteria."

After we had narrowed down the list of project options to the six we believed were doable, we were told the final voting would be done at the next meeting. Gene Zylstra and I were the two representatives from HOA and I told Gene I was going home and do my evaluations. Gene said that was not necessary because "we have already completed the evaluation" (or words to that effect) and he handed me a sheet of paper (Exhibit H). I was shocked to hear him say "we" because "we" certainly sounded like there had been collusion somewhere (Note that we had been told repeatedly to work alone when doing the analysis). Further, the analysis was to be based on the merits of the projects. We stood there, neither one saying anything for a little while. I then told him I would do my own analysis, picked up my book and papers and left the building..

I still have the copy of the "analysis" he gave me. It is junk. The initials at the bottom are: GZ.(Which I presume to mean Gene Zylstra). Its dated 4/27/98. Please note the "analysis" was not an analysis at all because:

1. It did not assign a "weight" to the criteria.
2. It did not rate each option on a scale of 1 to 9.

3. There certainly was no "yardstick" to substantiate the "YES/NO" entries.
4. There was no numerical way to measure and display the "worth" of an option.

In contrast to the apparently biased approach taken by Mr Zystra, I developed a matrix as intended by the Facilitator (Exhibit I). Now that I have had time to read the two-volume proposal for the Agua Fria project, I would rate it even higher than I did several years ago.

Re Page 8, first statement, last sentence. Beginning with:..."Since CAP water has been used for years.."

That last sentence is incredible in light of the following:

The "Preliminary Engineering Report for Citizens Water Resources.....Groundwater Savings Project" contains some interesting information on the subject of "salt leaching".

"....irrigation water contains salts....(which) can accumulate in the (grass) root zone to detrimental levels...."

The standard treatment for this problem is to periodically over-irrigate the grass to flush the salt accumulations downward below the grass root zone. The process is called "leaching".

According to the Preliminary Engineering Report we will apply (and pay for) 40,085,700 gallons of CAP water to the golf courses EACH YEAR just to FLUSH OUT THE SALT ACCUMULATIONS CREATED BY the pipeline scheme!. GRAVITY WILL ASSURE THAT THESE SALT ACCUMULATIONS WILL TRICKLE DOWN AND END UP IN THE GROUNDWATER UNDER SUN CITY.

This is madness! We would be polluting the very groundwater we are pretending to save.

Re Page 8, second statement. Beginning with: "After a great deal of study....."

This is a gross exaggeration. There was no "great deal of study" about the concept of using CAP water on golf courses. In fact, there was no "study" at all. The record shows that once, two people from Scottsdale came here and confirmed the use of some CAP water on some golf courses and also said some developers at the north end of town were paying for a new line to carry that CAP water to some new golf courses.

And Brown and Cauldwell did spend time developing the construction costs for the several options under consideration. And of course there were the usual observations about the efficacy of this idea. But there

CERTAINLY WAS NO "STUDY" in the engineering sense to validate the stated purpose of the golf course plan. Which was: "Save the water under Sun City for future use and also forestall the subsidence coming our way". Nor was there any technical evidence given to show why the "saved" water under Sun City would remain there and why it would not flow east or west or south....only "we know it won't" from proponents.

RE page 8, third statement. Beginning with....The more it was considered.....

This is not true. The golf option only looks good at first glance. That is: Until the idea that the "saved" groundwater under Sun City will accumulate there is seriously challenged. (Exhibit O) After all, on this planet, water seeks its own level.

Now as you look at some quotes from experts on groundwater, how is it possible to conclude that unpumped groundwater under Sun City will pile up and remain there if the water table under Peoria, Surprise, and El Mirage continues to drop? Remember, we share the same aquifer.

"Groundwater moves in response to differences in hydraulic head between two locations. The direction of movement is always from areas of highest elevation toward areas of lowest hydraulic head." ...David Ozsvath,..."Earth Sciences"

"The direction of groundwater movement is always down the slope of the water table." ...C.F.Tolman,...McGraw Hill

Gravity is the ultimate driving force in groundwater movement. ...The direction of the slope of the water table is also important because it indicates the direction of the ground water movement." ...U S Geological Survey Water-Supply Paper 2220

Groundwater will flow from areas where head is highest, called "recharge areas", to areas where head is lowest, called "discharge areas". ...Because the water table is the upper boundary, contour lines of the water table elevation drawn on a map indicate the direction of flow of groundwater in an unconfined aquifer." ...A.E.Kehew, "Geology For Engineers ..."

"...the basic principle of groundwater flow holds that water moves from a higher potential toward the lower. The contours on groundwater elevation contour maps are those of equal potential and the direction of movement is at right angles to the contours." ...U.S. Dept. of the Interior, Bureau of Reclamation

"Water moves from a position of higher hydraulic head to one of lower head, i.e. along a hydraulic gradient which is defined as the difference in hydraulic heads between two points divided by the distance of flow between them"....

Basic Geology for Science and Engineering. (Publisher not recorded)

"The water table is the surface of a water body which is constantly adjusting itself toward equilibrium condition. If there were no recharge to or out flow from the groundwater in a basin, the water table would eventually become horizontal."... Water Resources Engineering, McGraw-Hill

Re page 8, third statement. Beginning with: "The more..."

Looking back on the demeanor of the members and the way they absorbed the information presented, I believe no more than four of the 18 members had an engineering background. I was one of the four. One was obviously opposed to CAP. The other two were pipeline zealots who chose to ignore the law of gravity.

I consider the third statement a piece of fiction!

Please note: By contracting with the CENTRAL ARIZONA WATER CONSERVATION DISTRICT (CAWCD) to place our CAP water into the Agua Fria Recharge Project just a few miles north of SUN CITY, we can receive all the benefits of CAP water without any capital burden at all. BEST OF ALL IT'S UP AND RUNNING RIGHT NOW. Please see Exhibits K, L, M, and N. I have personally visited one large CAP recharge site near Marana, AZ and I have photos of many others on a computer disk but the images of the later are stuck somewhere in my computer and the printer won't print them.

Re page 8, Fourth statement, second sentence, beginning with "However...."

Because the Task Force majority did not understand groundwater movement, they were unable to realize that a plan would be irrational if it claimed that groundwater presently under Sun City could be "saved" (in other words "would pile up down there") if some golf course pumps were shut down. Of course such a thing will not happen. Common sense tells us that as the water level of our neighboring communities recedes, the "saved" water will tend to obey the law of gravity and flow "down hill". HOA IS CONGRATULATING THEMSELVES FOR MAKING AN UNFOUNDED ASSUMPTION.

Re page 8, last statement:

There appears to be nothing in the CAP Task Force Report that would convince "THE SERIOUS STUDENT of water use planning" that existing groundwater levels under Sun City would not recede over time in concert with that of our neighboring communities. This is probably the most egregious statement in this CAP WATER book.

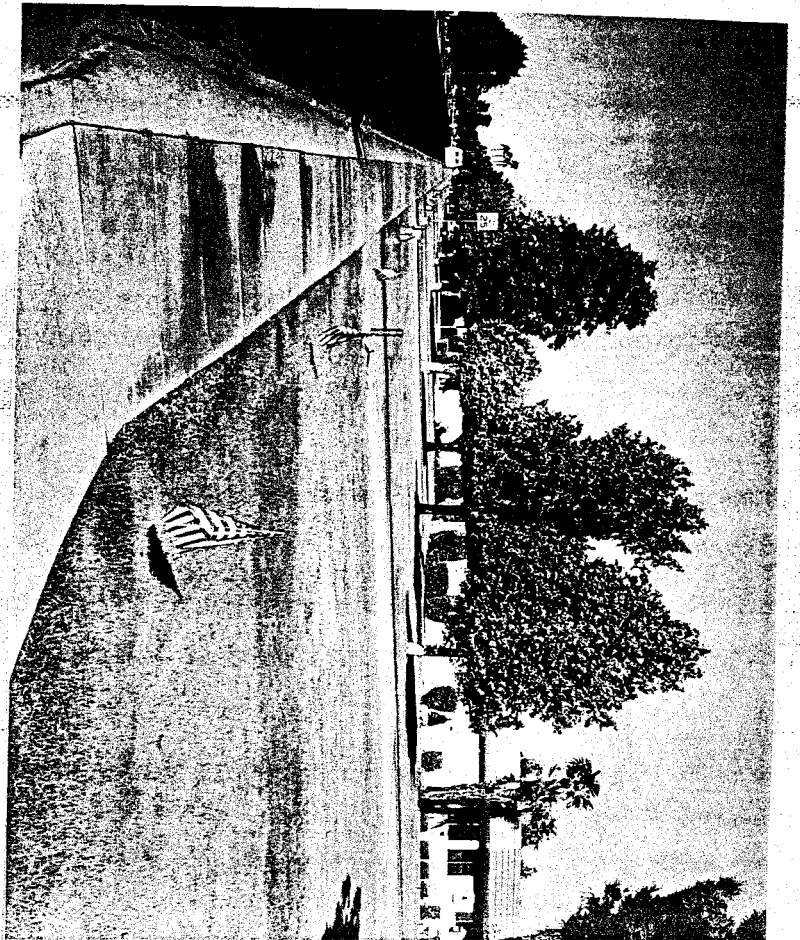
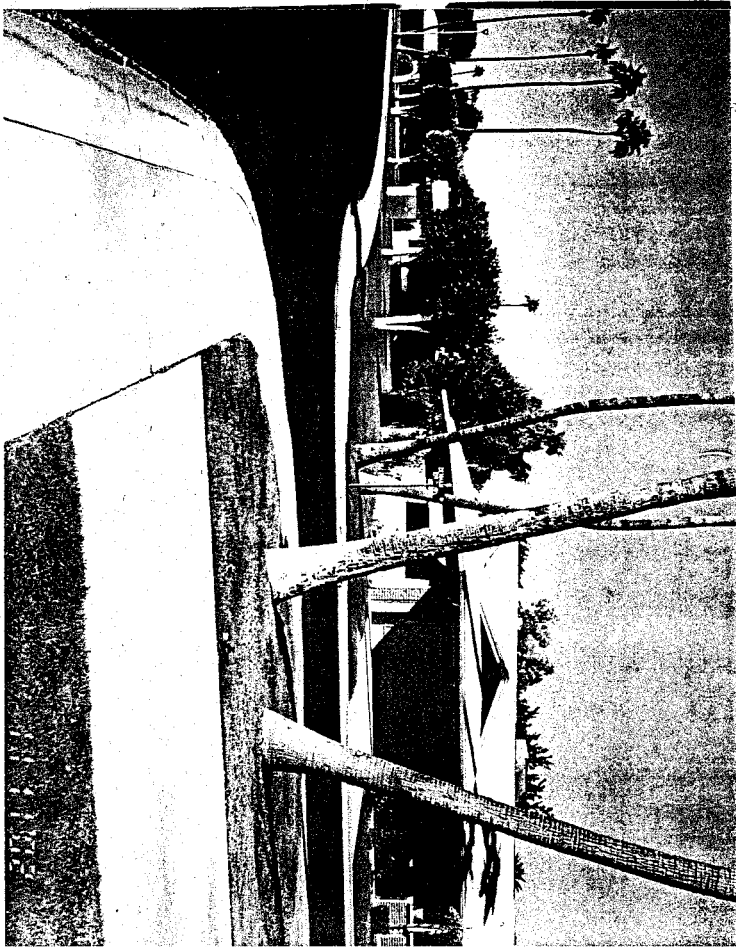
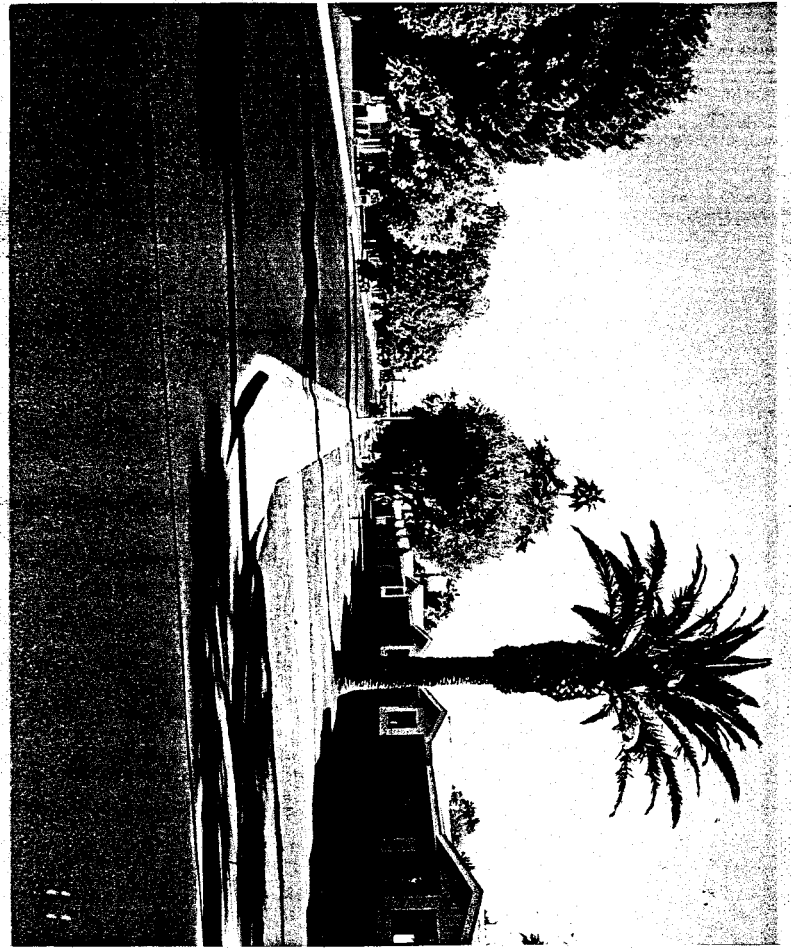
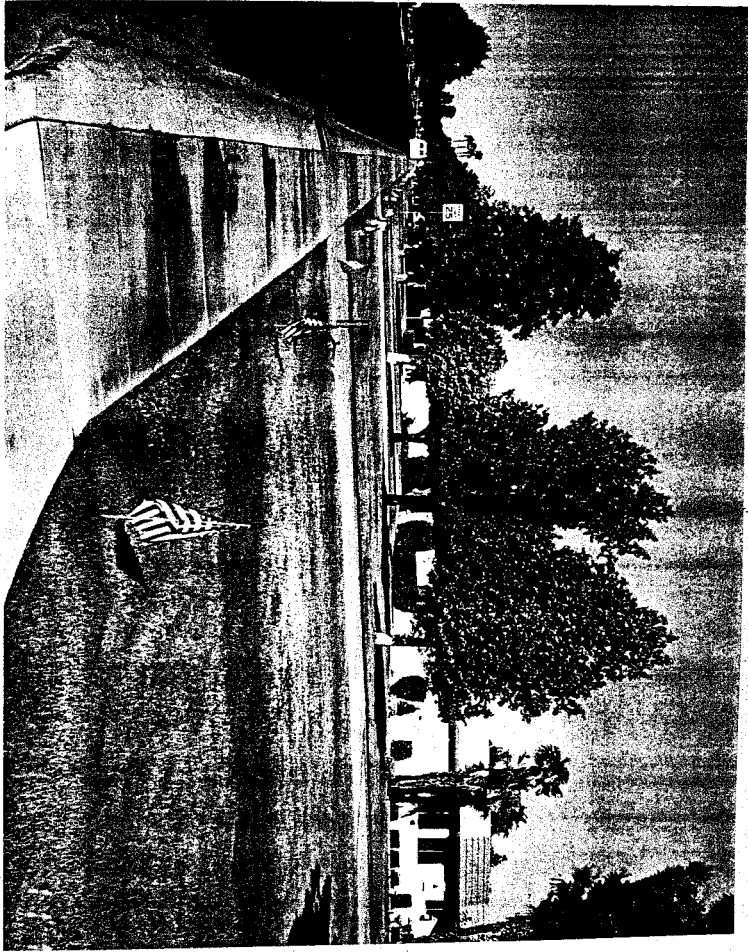


EXHIBIT A

1 INCH = 1/2 MI.

EXHIBIT "B"





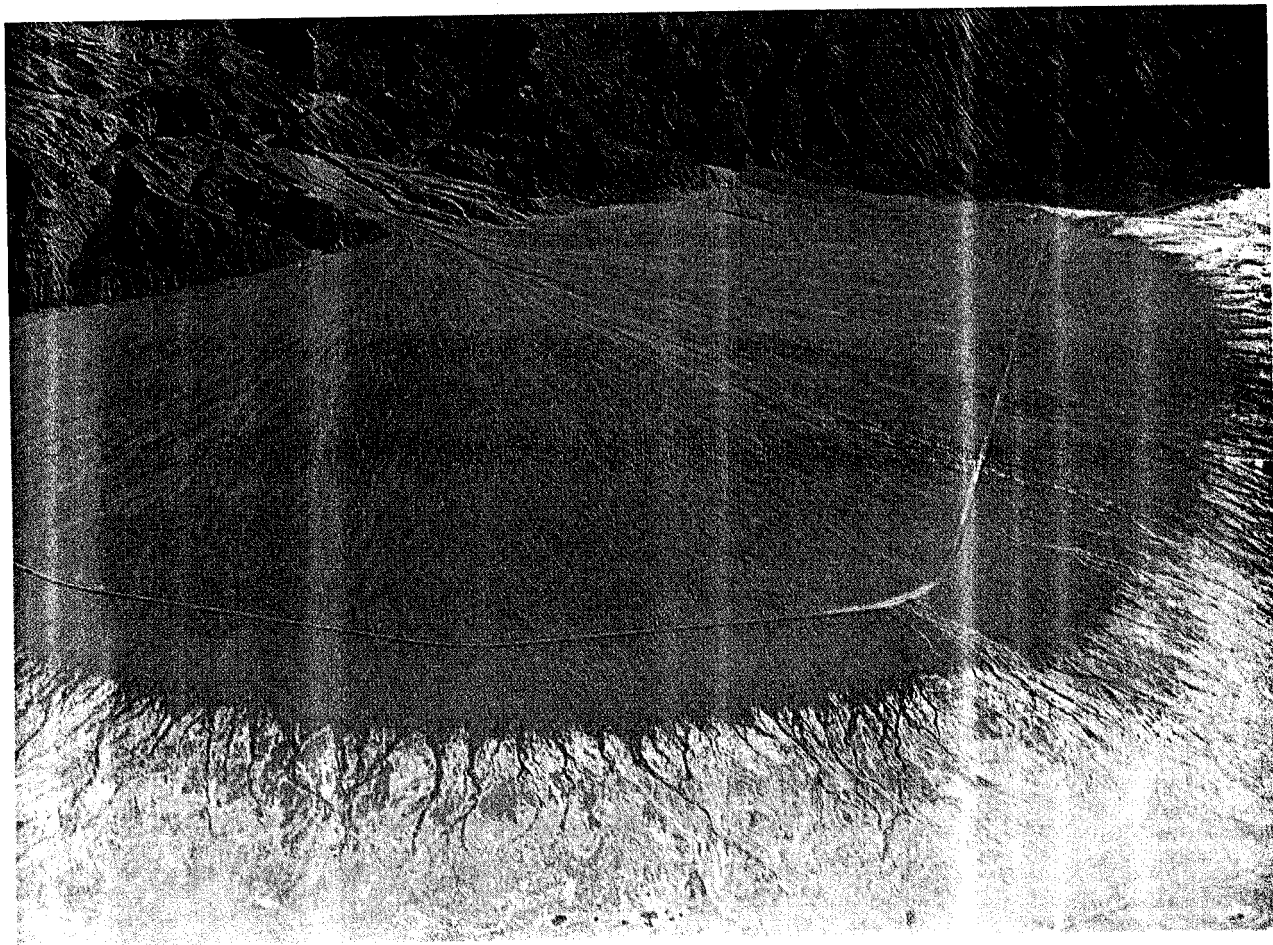


Figure 11.32
Alluvial fans form in arid regions where a stream enters a dry basin and deposits its load of sediment.



Figure 11.33
Alluvial slopes develop as fans grow and merge together. This photograph of part of the Sierra Nevadas shows large alluvial slopes, which cover much of the dry basin.

(HAMBLIN 1989)

EXHIBIT "C"

EXHIBIT "D"

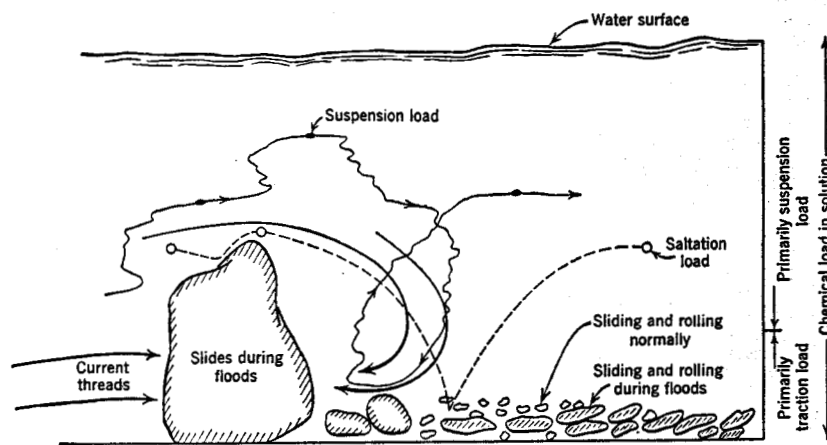


Fig. 7.21 Schematic illustration of the behavior of particles in downstream motion. With decline in turbulent energy some of the suspension load may become part of the saltation load, and some of the latter may become part of the traction load.

"BASIC GEOLOGY FOR SCIENCE AND
ENGINEERING"

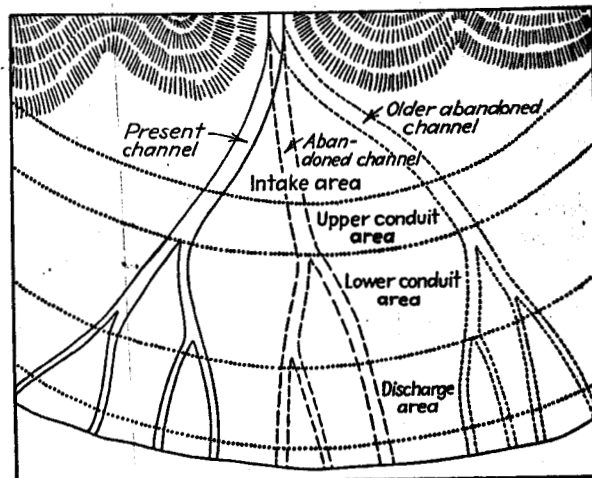
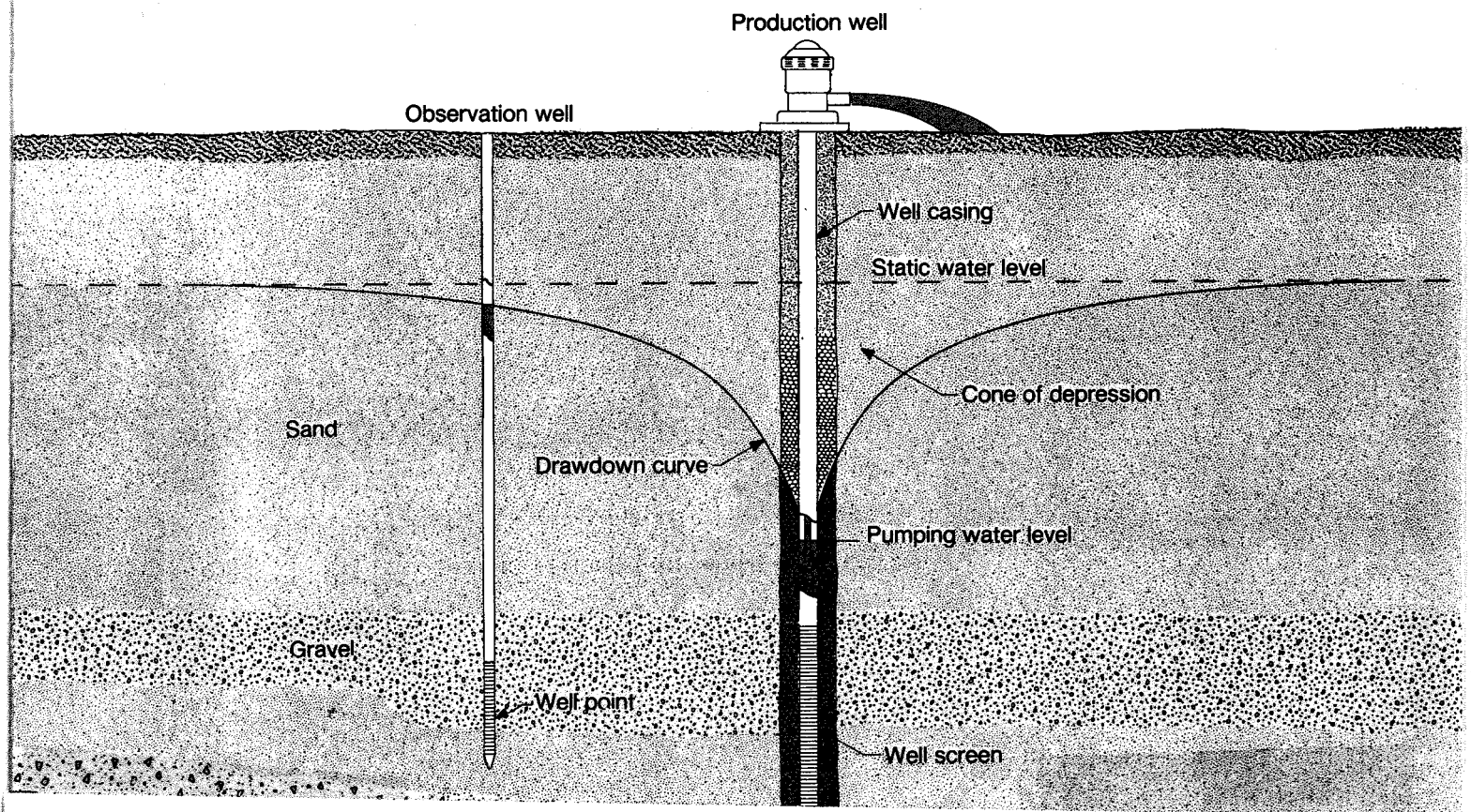
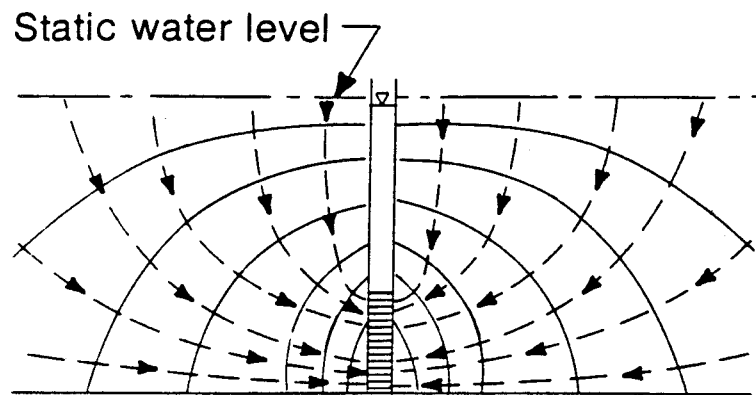


FIG. 139.—Plan of abandoned stream channels and present channel of stream in an alluvial cone.

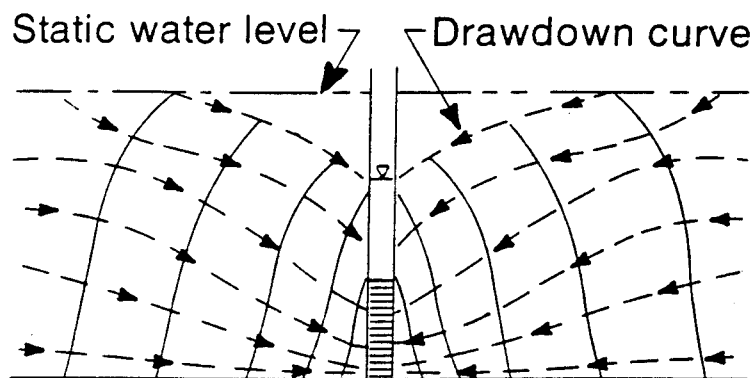
TOLMAN 1939

EXHIBIT "E"

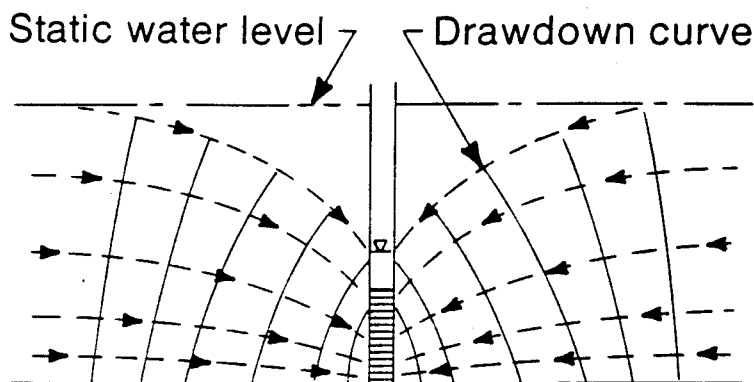




A. Initial stage in pumping an unconfined aquifer. At the instant the pump is turned on, water begins to flow toward the well screen.



B. Intermediate stage in pumping an unconfined aquifer. Although dewatering of the aquifer materials near the well bore continues, the radial component of flow becomes more pronounced.



C. Approximate steady state stage in pumping an unconfined aquifer. Profile of cone of depression is established. Nearly all water originates near the outer edge of the area of influence, and a stable, mainly radial flow pattern is established.

Figure 9.6. Development of flow distribution about a discharging well in an unconfined aquifer that is 33% screened. (*Water and Power Resources Service, 1981*)

Evaluation Results - Worth

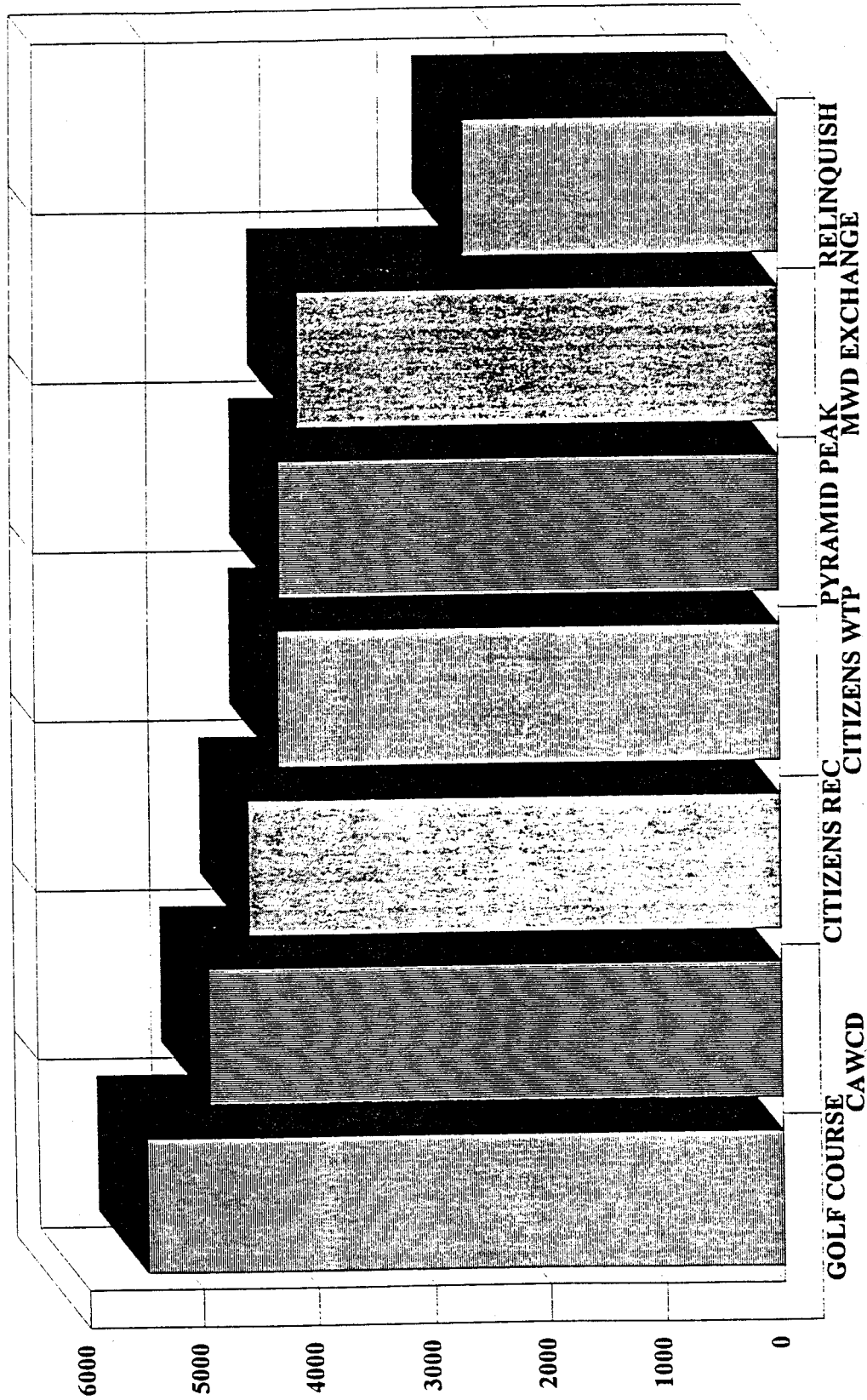


EXHIBIT "6"

EXHIBIT "6"

Jack Force - w/ SunCity Costs

EXHIBIT "H"

GENERAL CRITERIA FOR RATING
CENTRAL ARIZONA PROJECT
WATER OPTIONS

	LEASE FROM CENTRAL AZ WATER CON- SERVATION DISTRICT	CITIZEN'S UTILITIES RECHARGE	DIRECT USE ON GOLF COURSE	CITIZEN'S UTILITIES WATER TREATMENT PLANT	MARICOPA WATER DISTRICT
<i>Not part of criteria</i> CONTINUE PUMPING GROUND WATER	YES	YES	NO	NO	YES
DIRECT BENEFIT TO SUN CITY	NO	NO	YES	YES	NO
USE & USEFUL TO SUN CITY	NO	NO	YES	YES	NO
TIMELINESS OR IMPLEMENTATION	SEP 1999	DEC 2000	JULY 2002	DEC 2003	DEC 1998
MEET REGULATORY COMPLIANCE	YES	YES	YES	YES	YES
QUALITY OF WATER FOR SUN CITY	N/A	N/A	GOOD	DRINKING	N/A
SUBSIDENCE IN SUN CITY (PREVENT)	NOT SURE	MAY HELP	HELP PREVENT	HELP PREVENT	NOT SURE
EST. MONTHLY COST (1)	.24/MO	2.69/MO	4.32/MO	5.67/MO	-.20/MO
PER HOUSEHOLD (2)	.24 MO	2.94/MO	4.65/MO	6.58/MO	-.20/MO
(CAPITAL/OPERATING)					
(1) COMBINED WITH SUN CITY WEST					
(2) SUN CITY ONLY					
NOTE: ESTIMATED ADDITIONAL MONTHLY COSTS FOR HOLDING CAP WATER AND DELIVERY CHARGE	1.48	1.48	1.48	1.48	1.48

OPTIONS

EXHIBIT
1

CRITERIA

↓ (RANGE 1 TO 3)

OPTIONS →			RECHARGE CAWCD	CITIZENS RECHARGE		DIRECT GOLF COURSE IRRIGATION		CITIZENS WATER TREATMENT PLANT		LEASE SPACE IN GLENDALE WATER TREATMENT		DIRECT EXCHANGE MARICOPA WATER DISTR.		
EXHIBIT "I"	ENTRIES													
CRITERIA	HOW WELL OPTION MEETS CRITERIA	PRODUCT OF WEIGHT AND EFFICACY	HOW WELL ETC	PRODUCT	HOW WELL ETC	PRODUCT	HOW WELL ETC	PRODUCT	HOW WELL ETC	PRODUCT	HOW WELL ETC	PRODUCT	HOW WELL ETC	
ATED ① TO ③ BASED ON IMPORTANCE ↓ (RANGE 1 TO 3)														
DIRECT BENEFIT TO CUSTOMERS AND MITIGATES DEPLETION ②	THIS COLUMN	THIS COLUMN	⑦	14	⑦	14	⑨	18	⑨	18	⑨	18	⑤	6
EXTENT DEEMED USED AND USEFUL" ③			⑦	21	⑦	21	⑨	27	⑨	27	⑨	27	⑤	9
TIMELINESS: NOT LATER THAN DEC 30 2000 ③			⑨	27	⑦	21	③	9	①	3	⑤	15	⑨	27
REGULATORY COMPLIANCE. ADR SAFETY YIELD GUIDE LINES MET ③			⑨	27	⑨	27	⑨	27	⑦	21	⑦	21	⑤	15
PUBLIC ACCEPTABILITY. LIKELY PUBLIC CONCURS SUPPORTS PLAN ②			⑤	10	⑥	12	⑦	14	⑤	10	⑤	10	③	6
WATER QUALITY. DOES BLEND DEGRADE DRINKING WATER? ①			⑨	9	⑨	9	⑨	9	⑧	8	⑦	7	⑨	9
SUBSIDENCE. MITIGATES POTENTIAL FOR SUBSIDENCE ①			⑤	5	⑤	5	⑤	5	⑥	5	⑥	5	⑤	5
COST (GRADING INVERSELY PROPORTIONAL TO COST ②			⑨	18	⑤	10	③	6	②	4	②	4	⑨	18
→ TOTAL OF PRODUCTS (WORTH)				131		119		115		96		90		95
														EXHIBIT "I"

AGUA FRIA RIVER RECHARGE PROJECT

The Agua Fria Recharge Project (project) is being developed by Central Arizona Water Conservation District (CAWCD) as a State Demonstration Recharge Project constructed for the benefit of the State of Arizona and funded by property tax revenues collected by CAWCD in its capacity as a tax-levying public improvement district of the State. The primary purposes of this recharge project are to replenish the severely over drafted aquifer in the West Salt River Valley and create an opportunity to more fully use Arizona's unused Colorado River allocation.

The project will utilize the natural channel of the Agua Fria River and constructed spreading basins to recharge up to 100,000 acre-feet per year of Central Arizona Project (CAP) water and replenish the aquifer in the west Salt River Valley. The project area extends from the CAP Aqueduct-Agua Fria River Siphon, downstream within the Agua Fria River channel for approximately 4.5 miles to a series of infiltration basins to be located north of Hatfield Road and west of 107th Avenue. The project area includes portions of Sections 17, 20, 29, 31 and 32, Township 5N, Range 1E, and Section 6, Township 4N, Range 1E. CAP water will be discharged from the siphon and flow downstream within the natural channel to a small earthen diversion dam located near Jomax Road. From this point the water will be conveyed to the recharge basins.

As a State Demonstration Project, authorized by statute, the project will benefit the state in the following ways: 1) protect the general economy and welfare of the state and its citizens by encouraging the use of renewable water supplies instead of continued reliance on limited groundwater supplies; 2) store currently unused CAP water for future needs through recharge and replenishment of over drafted aquifers; and 3) provide an additional source of water for times of serious water shortage due to a substantial reduction in the supply or a prolonged interruption of deliveries of CAP water.

Benefits resulting from recharge will be most notable within the West Salt River Valley that includes portions of Phoenix, Glendale, Peoria, Sun City, El Mirage, Youngtown and Surprise. Decades of groundwater pumping for agricultural irrigation in this area has resulted in lowering of groundwater levels by over 350 feet directly south of the project area and this trend is projected to continue. Groundwater overdraft in the West Salt River Valley has resulted in increased energy costs to pump groundwater from greater depths, deterioration of water quality by withdrawing poorer quality water from deeper in the aquifer and geologic hazards such as land subsidence, earth fissuring and aquifer compaction.

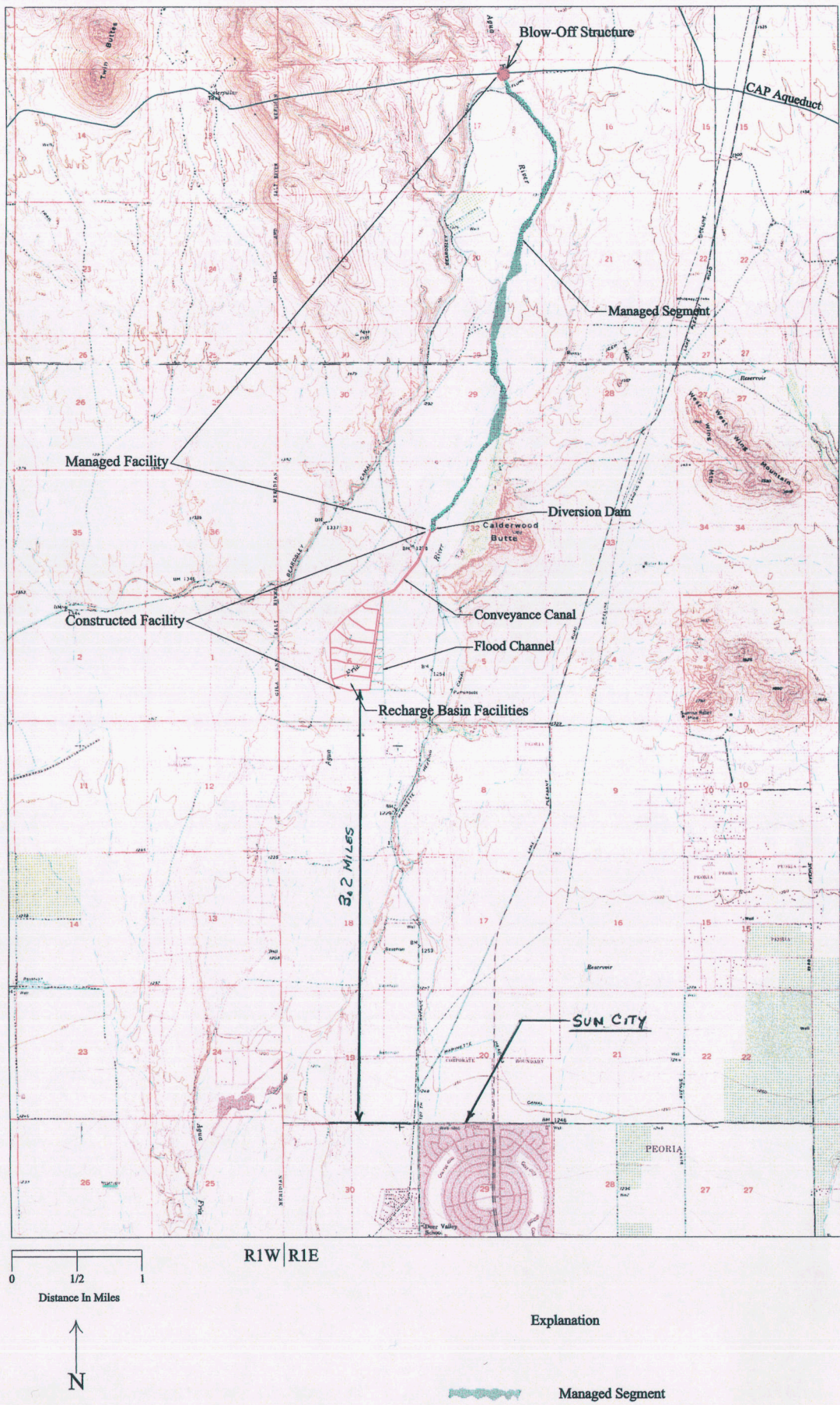
The project is located at the margin of an area where groundwater declines have been most severe and where recharge will directly replenish aquifer water levels and mitigate the negative impacts of overdraft. The Arizona Department of Water Resources (ADWR) supports this project for its hydrologic benefits and has issued the necessary permits to authorize construction.

A number of state and municipal entities are dependent on recharging CAP water in this project to achieve their respective mandates. The Arizona Water Banking Authority (AWBA) was created by the legislature in 1996 to recharge CAP water in order to firm existing water supplies for municipal and industrial users for future shortages; to help ADWR meet the water management objectives required by state law; and to assist in the settlement of Indian water rights claims. Unfortunately, the lack of available recharge facilities currently limits the AWBA ability to achieve its goal of recharging 500,000 acre-feet annually. The AWBA strongly supports the project and has committed to storing at the project because: 1) AWBA is required by statute to utilize state demonstration recharge projects; 2) the 100,000 acre-feet of storage capacity will bring the AWBA much closer to realizing its annual goal and 3) recharge at the project will achieve significant water management benefits by replenishment of the West Salt River Valley's over drafted aquifer.

The Central Arizona Groundwater Replenishment District (CAGRD) will use the project to help fulfill its groundwater replenishment obligation for the Phoenix Active Management Area. The CAGRD must replenish the aquifer to replace excess groundwater pumped by municipal providers. Recharge at the project will allow the CAGRD to achieve maximum water management benefits by allowing it to replace groundwater pumped by West Salt River Valley municipal water providers through recharge in the same geographic region that is was withdrawn. Without the project, the CAGRD will have to settle for recharge at projects in less desirable locations that may not directly replenish the effected aquifer.

West Valley cities that elect to recharge all or a portion of their CAP allocations at the project will receive significant economic benefits. CAP water stored underground at the project can legally be recovered by municipalities using existing service area wells, even if located far from the recharge project, thereby eliminating the need to construct expensive water treatment plants and pipeline distribution systems in order to take delivery and use of their CAP allocations. Cities that recharge and recover CAP water will also benefit by reducing their dependence on limited groundwater reserves by taking advantage of currently available excess CAP water at subsidized water rates.

EXHIBIT "K"



T5N
T4N

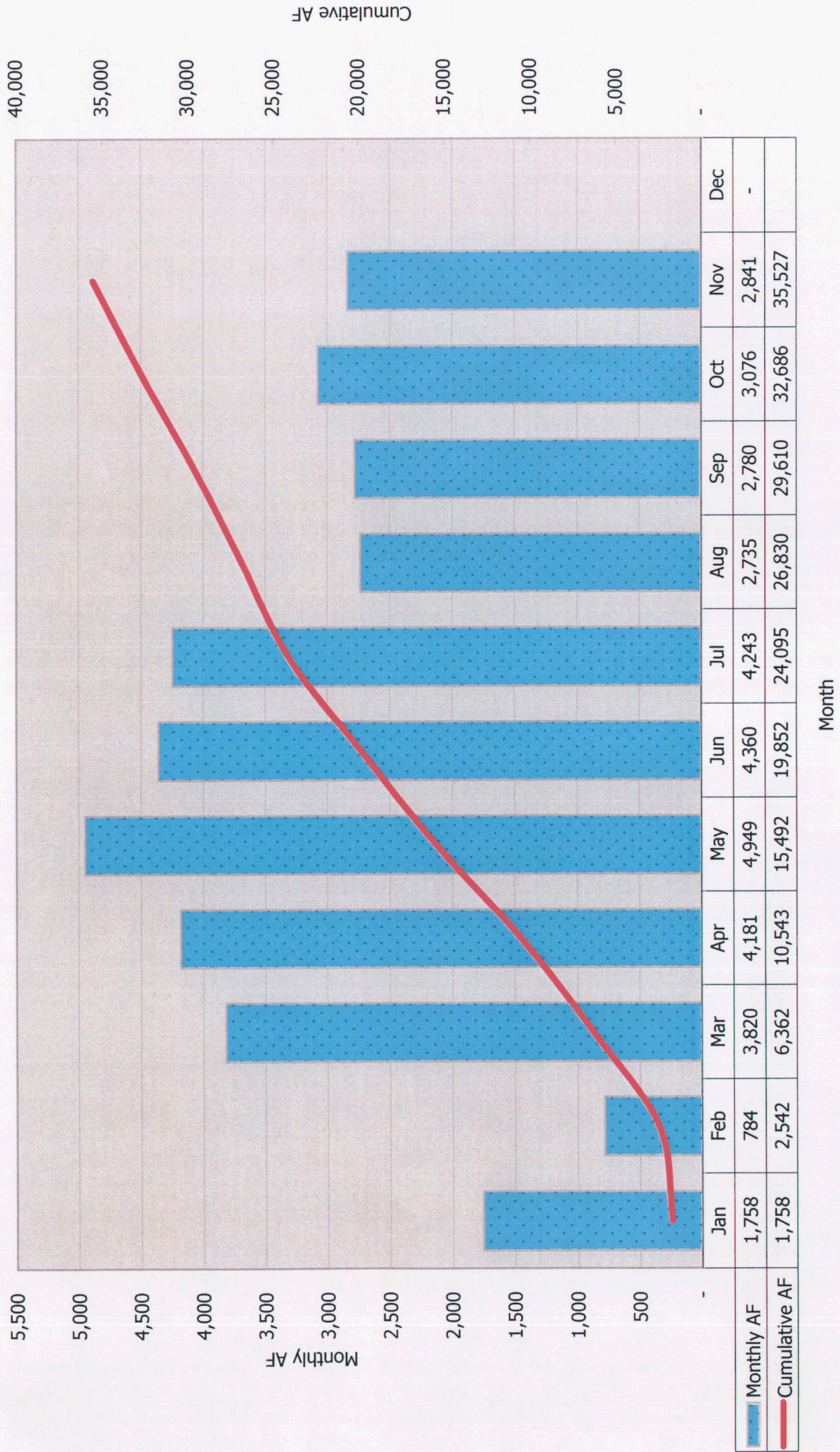
 **HydroSystems, Inc.**
GARY G. SMALL, M.S., P.G., C.E.I.
1220 S. PARK LANE, SUITE 5 TEMPE, AZ 85281
TELEPHONE: 602-517-9050 FAX: 602-517-9049

Project Location Map
Agua Fria Recharge Project

EXHIBIT "K"

Figure 1

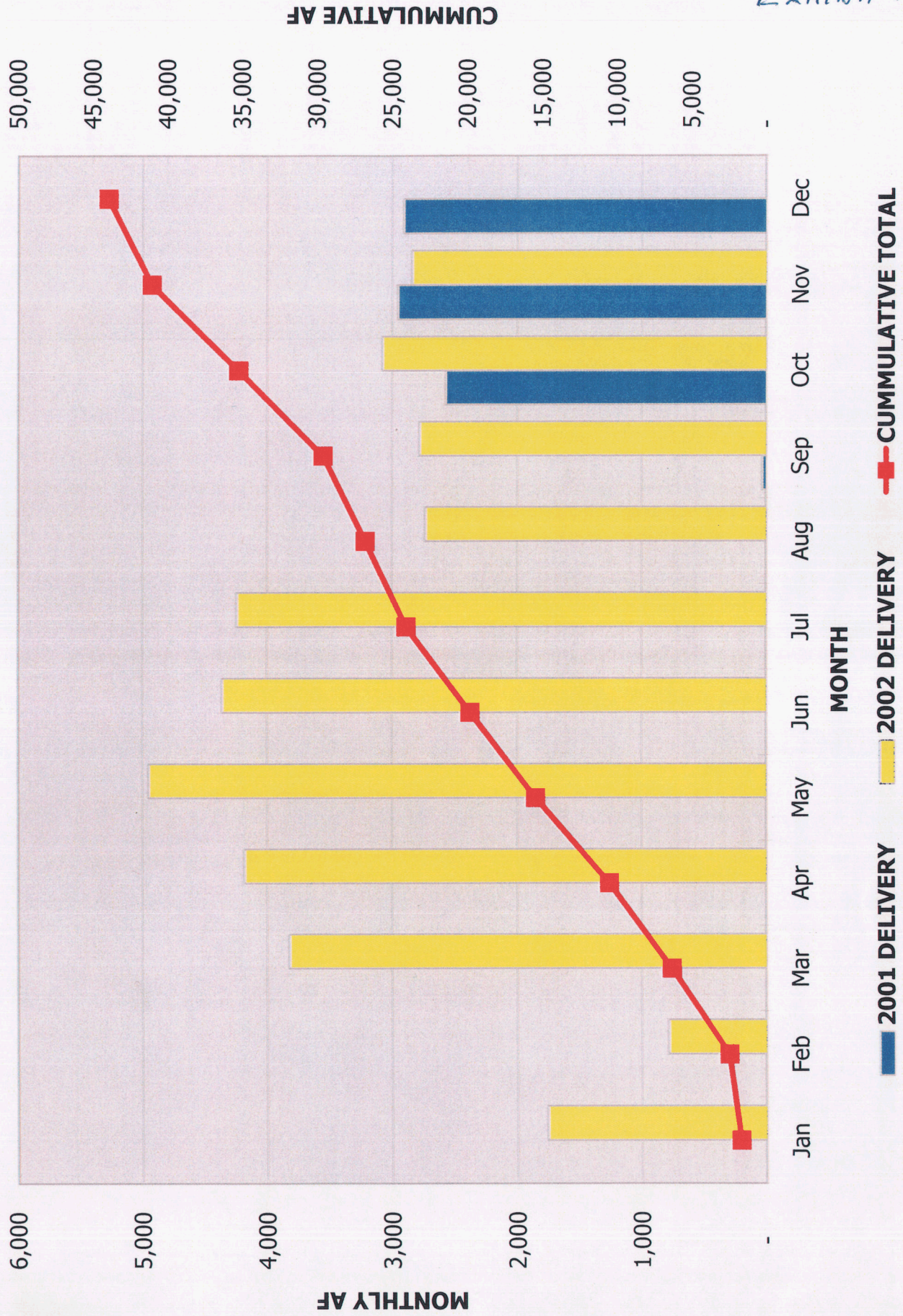
AGUA FRIA RECHARGE PROJECT DELIVERIES
2002 MONTHLY AND YTD CUMULATIVE ACRE-FEET (AF)

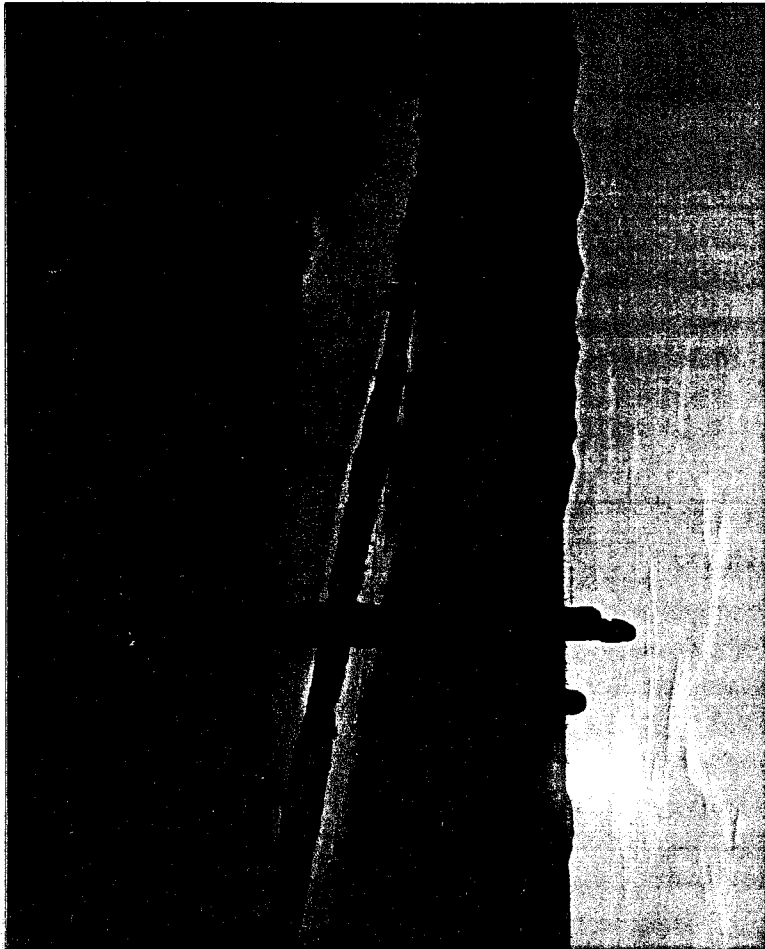
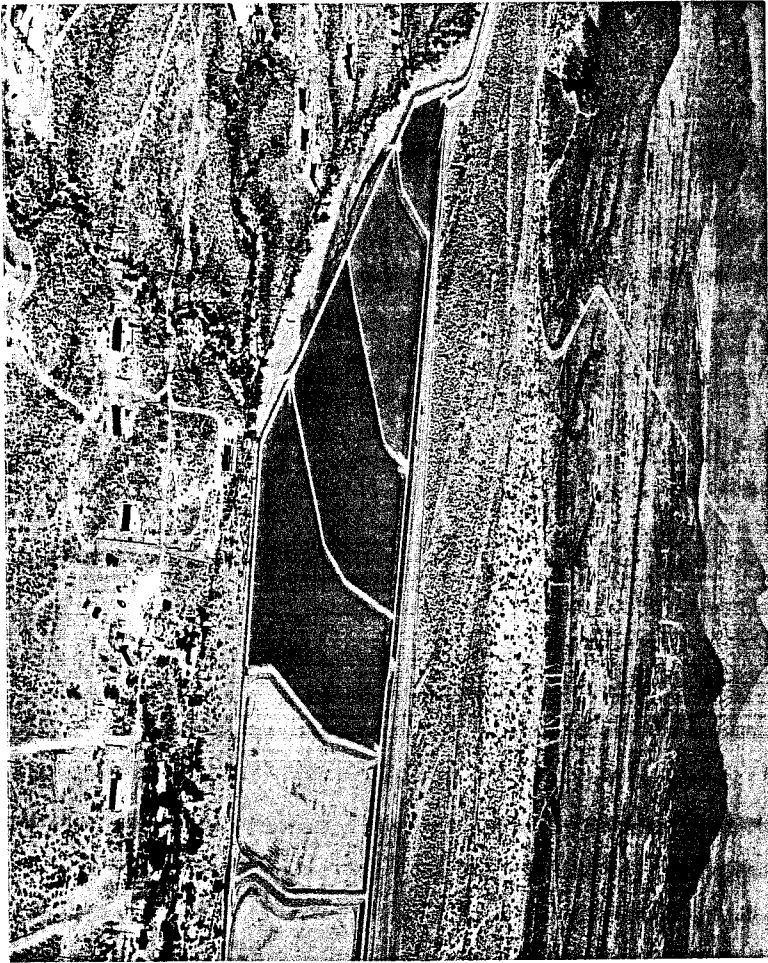


AGUA FRIA RECHARGE PROJECT **Acre-Feet (AF) of CAP Water Delivered**

EXHIBIT "M"

EXHIBIT "M"





QUESTION OF THE YEAR

1. If one had a metal pan with an area the size of Sun City and we poured in enough water to equal our CAP allotment, the water would be about 5 1/2" deep. Let's call it 0.46 feet.
2. But groundwater exists only in the spaces between the mix of buried clay, silt, sand, and gravel particles that make up the aquifer. The mix is called alluvium.
3. And the average porosity of the alluvium should be about 25% if it is deposited in the traditional layers.
4. Lets fill the metal pan with typical alluvium.
5. Therefore, one year's worth of CAP water poured into the alluvium would be 0.46 ft divided by 0.25 = 1.85 ft deep.

5 year's worth would be 9.25 ft deep.

10 year's worth would 18.5 ft deep.

20 year's worth would be 37 ft deep.
6. Lets make another enclosure that has the same area as Sun City but has its sides made of metal mesh or screen and also fill it with alluvium. Lets pour in one (or 5, 10 etc) years worth of CAP water. What happens? The water runs out horizontally.
7. AND THAT IS WHAT WILL EVENTUALLY HAPPEN TO OUR UNPUMPED GROUNDWATER THAT THE PIPELINE CROWD CLAIMS WILL ACCUMULATE UNDER SUN CITY! Sorry. Water seeks it's own level on this planet.
8. The pipeline project is junk.